

A N
E S S A Y
O N T H E
FORMATION *of* MOUNTAINS,

W I T H
A Description of that surprizing Ridge of
Black Mountains in the North Parts of this
Kingdom ; with convincive Proofs, that the
Earth was not thrown on such Heaps by the
GREAT DELUGE.

A L S O
Reasons explain'd for the Springs of HOT WATER
coming out of the Bowels of the COLD EARTH.

L I K E W I S E
Reasons shewing, why that great Current or Stream always
sets in at the Mouth of the *Mediterranean*, called the
Straits of Gibraltar : and that Sea, which has no other
Communication with the main Ocean, but at that narrow
Passage, is still never the fuller.

By Mr. THOMAS HUDSON. *K*

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FORMATION *of* MOUNTAINS.

HAVING frequently heard the opinion the people of these mountainous countries have always supported concerning the earth being thrown on such heaps by the Deluge, induced me to make the following observations.

This immense ridge of Black Mountains, being so called from their black aspect, as being covered with nothing but heath and ling, has its rise in the county of Derby; and extends northward through the middle of the nation, forming one continued range of different elevations, quite into Scotland; causing very deep valleys all the way on both sides, which run with a descent on one hand to the east, and on the other to the west: in the bottom of every such valley,

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runs

runs a large rivulet or brook, being collected from the many springs, with which the tops and sides of these hills everywhere abound. There are many of these mountains, which are from their base to the summit, upwards of three miles of a steep ascent, and must consequently be more than half that height perpendicular.

The tops of these mountains are so extremely barren, that they produce no other vegetables but heath, ling and moss, with which they are entirely covered; except some rushes in wet places: the heath is in most places pretty long, and the moss growing every where very thick under it.

The earth at its surface is quite black; is very soft, porous and spongy, much resembling a rotten dunghil: its atoms are smooth, containing no manner of gravelly substance. This kind of earth they call turf-earth, or turf-moss; I have seen it in many places, from ten to fifteen feet deep, before it comes to that which appears to be the natural soil, which is a brown gravelly mold like that of other lands. This kind of turf-earth, or turf-moss, as experience has shewn, will produce nothing but the heath, ling and moss, which naturally grows upon it; having been, for experiment's sake, digged and sowed, with different sorts of grain, and other seeds, which will spring up and flourish so long as the body of the seed

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exists,

exists, and then immediately dies and withers away; which is a convincible proof, that this sort of earth is incapable of affording it any nutriment. The superfluous earth which covers the natural, seems to be the production of the moss, &c. that grows upon it; of which very probably, like other vegetables, new crops are annually produced, the former still adding to that light spongy substance on which it grows; for it indeed seems nothing but a body of rotten moss; which most certainly contains no manural quality.

It has here been observed, that in about half a century past, this sort of earth in some places, particularly where is the thickest growth of moss, has increased and swelled up more than two foot in thickness; which seems to be a clear demonstration, that all that spongy substance (of ten or fifteen feet deep in many places) which covers the solid, derives as aforesaid from the moss that grows upon it.

In this kind of earth, they dig turf, or as they term it peat; by which means have frequently been found large oak trees; some of which near three feet in diameter, having part of their branches remaining, three or four feet from the main trunk, and entirely sound.

These trees lie at the bottom of this soft turf-moss, resting on the more solid or natural ground, where they undoubtedly once

grew and flourish'd: but 'tis impossible to prevail on the people of these countries to believe any thing of this kind; they still insisting on the validity of tradition, viz. that the mountains were laid; and those trees carried there by Noah's flood, as being frequently found on the tops of such barren mountains, where neither tree, plant, or any vegetable (except heath, ling and moss) will grow, or is any growing in the present age, perhaps for more than two or three miles from some of the places, where such trees of different sizes and sorts have been found.

About the year 1733, in the parish of Chapelinfrith, in the north part of the county of Derby, I was witness to the digging up of an oak tree, on the top of one of the highest mountains in that country; the trunk of which measured, to the best of my knowledge, twenty-two inches diameter, and about twenty-five feet long; and near it was one of a smaller size: and about half a mile from thence was digged up, which I likewise saw, near a cart-load of smaller pieces, and all of them perfectly sound. 'Tis to be observed, these pieces were the entire heart, the sappy part on the outside being all perished.

Some of these black mountains having of late years been inclosed, and strongly manured with lime, it has, in two or three years time, so fermented this sort of earth,
as

as to reduce that which was in some places five or six feet, to less than two feet deep; converting it to a fine mellow mold, and produces good grass: which land now appears to be in its primitive nature: and those trees did indisputably once grow on the very places on which they have been found: and that the very summits of these great mountains, as well as of others, are the natural surface of the earth as first created, seems in my opinion to be beyond all doubt: and that the vallies however so large, have some time since the creation subsided from them: my reasons for which shall endeavour to make as obvious as possibly I can.

I have many times observed, that the body of the earth in these mountains (some of which contain two or three miles of flat land on the top) is much more regular in regard to the beds of stone and coal which are in them, than in the vallies; which in the former lie at pretty near an equal distance below the surface, quite from one side to the other; as is well known by the number of coal-pits which are on several of these mountains, which great beds of stone they in many places dig through, before they come to the bed of coal.

At the brink, or edge, of some of these mountains, the ascent is somewhat regular; but in many places a steep acclivity of stone rocks, some of which, I know, to be more
than

than an hundred feet high: and are the face of those very beds of stone, which in some places lie regularly through the mountain; which very plainly shews, that the mountains have undergone no alteration since the creation. Some of these rocks (as before-mentioned) stand vertical, others much impending, just as the earth broke off, at the time of the vallies thus sinking.

Beneath some of these rocks are several acres of land quite covered with stones, lying one upon another in a most confused manner, being just as they were jumbled together by the fall, when the sinking of the earth in the valley caused the beds of stone thus to break off. These large stones, some of which I have seen fourteen or fifteen feet in diameter, being heaped one upon another in this irregular manner, form many cavities under ground, which are excellent harbours for foxes, badgers, &c. and the reason those animals are so numerous in such places: they have been known frequently to come out of the earth more than an hundred yards from where they went in.

The beds of coal thus broke off, as well as the stone, are to be seen in the face of some mountains, in several of the northern counties; and it is to be observed, that where there is a bed of coal in the mountain, there is generally the same in the valley below, but not lying near so regular;
for

for in many places the bed is broke, and rises or falls all on a sudden, perhaps eight or ten feet, and in some places more; which they call a fault in the bed of coal, and which is never found in flat plain lands.

These beds of coal are always covered with deeper body of earth, or, as may be said, are deeper from the surface, towards the bottom of the valley, than at the top ; or, in their terms, the drip of the bed of coal is more than that of the surface: for which, I think, the following reason may be justly ascribed, viz. that when the vallies thus subsided, or, as it may be termed, when the loose or more unsolid part broke off, from that which is more stoney and firm, the force of its own ponderous weight carried the largest quantity of that earth, which lay above the beds of coal, towards the bottom of the valley, as well as forcing the beds of coal into the same form: which towards the tops of the valleys lie generally quite at, or near the surface, and perhaps not thicker than the edge of a half-crown, and at the bottom of the valley gradually increasing, they lie in some places forty fathom deep, and six or eight feet thick: and where the upper part of the valley is very steep, it may be depended on there is no bed of coal there: and towards the bottom it lies so very deep, by such an immensity of earth showing down upon it (as at the time of the sub-

subsidence, the earth broke off so down-right) that 'tis seldom in such places practicable to get them out of the earth; but where the sides of the valley are of a more easy and regular descent, the bed of coal lies all the way from the top to the bottom, but very thin, and near the surface towards the top, and thicker and deeper towards the bottom; which circumstance is a convincing proof against the prevailing notion to which the people are so strongly attached, concerning the mountains being cast up by the great deluge. There can be nothing more evident, than that the highest mountains are the natural surface of the earth, and that, not only the vallies have sunk so far below them, but even the mountains themselves are in some places left hollow by the more unsolid parts underneath subsidings, and leaving them, which are an entire body or crust of stone, to stand like an arch, which supports a great hill over it; thereby forming surprizing caverns underground; a specimen of which may be seen in the many great caves in the Peak hundred, in the county of Derby: not only to mention the great cave called the Devil's A-se, at the town of Castleton, and Poole's cave near Buxton, but also many others; besides five or six rivulets or brooks, all in this part of the country, which fall or take their course into the caverns in the ground, and continue
their

their way through the infractured rocks in the bowels of the earth, under hills and valleys, some for two or three miles, before they again appear: and the cause of that eye so downright in the earth, called Elden-hole, in the Peake forest, described as such a wonder by many writers, was occasioned by the sinking of the under part of the earth, when that place, being more loose than the rocks that surround it, dropt down also; thereby making that frightful chasm in the earth, the rocky sides of which resemble a kind of rough wall, the earth all round being an entire body of stone; and in all probability it may communicate with other caverns in the earth, which might have been formed at the same time. The depth of this pit could never be ascertained for water. The under parts of the earth in this place, must have subsided a prodigious way, or that earth which once filled it could not have sunk down so far; it having (saith Cotton) been plumbed more than four hundred fathom. One mile to the west of this wonderful pit, is one of those shattered rocks into which falls one of those brooks as before-mentioned, and two miles to the north, is the great cave at Castleton.

The reason of the earth so sinking and forming such deep vallies and caves in many parts of the world, I think, cannot all be attributed to earthquakes, but rather to the

earth not being so firm and solid, as in other places ; which perhaps might proceed from its being so full of water as its interior parts consequently must, from the multitude of springs, with which such mountainous countries mostly abound : except where they are received downwards into subterraneous caverns, which happens chiefly on the limestone lands, and where there are springs, there they are immensely large. I believe I may aver, that before the vallies thus subsided, the lands which are now the very summits of the mountains, and so barren as I have described, were once a fertile earth, and doubtless productive of those trees which have been, and are, so frequently on them found.

Why the tops of such mountains are so impoverished since they produced those trees, I think, the following consideration will hold good : first observing, that in all probability when the earth was in its original form, that land, which is now the mountains, was then the highest ; for notwithstanding the vallies are so immensely deep, they have still a descent into the plains or flat countries below.

As the face of the earth before the vallies subsided, was more upon a level or plain, the cold, piercing winter winds passed with more freedom and moderation ; but since such parts of the earth are left so high above
those

those which subsided from them, they are now not only exposed to those winds, which drive along close to the surface of the earth, but also to the severity and rigour of all that quantity of cold, piercing, frosty winds, which is contained and moves in all that open space from the bottoms of the vallies to a level with the tops of the mountains ; for all that piercing wind which fills the whole open space of a valley of some miles deep, by forcing upon the face of the mountain, becomes all compressed together, and drives along the top both stronger and colder in proportion ; and has certainly been the destruction of all those species of trees which once grew there, as well as reducing the land to its present impoverished state : and from this motive only, the tops of the mountains so much exceed the valleys in coldness, and from the extreme coldness proceeds their present barren condition. When it is snow, with such piercing, frosty winds, it is so cold upon such high hills, as often proves fatal to many that attempt to pass over them.

These reasons, I think, are sufficient to obviate the possibility of such mountains once having been capable of producing those great trees, and a decisive demonstration that the prevailing opinion of the world is absolutely fabulous, that the mountains were

laid, or the trees carried there by the great deluge.

It is not to be supposed, that the earth was created without small vallies convenient to carry off the waters, and every thing else necessary : so as to make me with wondering eyes, to behold the surprizing unlimited power of the great divine existence, who has left nothing deficient in the admirable works of his creation.

Near Buxton bath, that place of ancient fame,

There stands a mountain, Axedge call'd by name,

Four rivers from its lofty summit flow,

Which duly east, west, north, and south, do go.

Wey east, Dane west, Goit north, Dove south's their course,

Near twenty miles each steers thus from its source.

Wey unites Derwent, Dane's in Weever spent,

Goit Mersey joins, Dove terminates in Trent.

When I of Derbyshire a view did take,
And in that part call'd th' Hundred of the Peak,

Survey'd high rocks, and gorgeous mountains tall,

And also what they Seven Wonders call,

I. There

1. There Chatsworth, noble palace, I did
view,
Much past my art, in praise to speak its
due,
Surpriz'd to see, 'mongst rugged moun-
tains, stand
That stately pile, the pride of Britain's
land.
2. Near Castleton, Mam Torr I saw, so high,
When at the foot, the top seem'd at the
sky;
A spacious mountain's front, vast high and
steep,
In some past age, its surface—off did slip,
E'er since its shivering face down trickling
kept,
By which below hills upon hills are heapt.
3. The next, of Elden-hole I had a sight,
A frightful chasm in the earth downright,
Of which no bottom yet was ever found,
Though plumb'd four hundred fathoms
in the ground.
4. And then to Buxton bath my way I took,
Where I amaz'd, on nature's works did
look,
That waters there (a most surprising thing)
So near one place, both hot and cold should
spring.
5. From thence, to see Poole's Cave then I
did go,
Which rocky, dismal cell my guide did
show ;

Where

Where we did march full half mile under
ground,

And such a rugged, craggy path I found,
That when I back again had steer'd my
way,

My soul rejoic'd to see the light of day.

6. At Bar Moore view'd the ebb and flowing
well.

7. At Castleton I saw the ar-e of h-ll.

The highest hills from Tweed to Trent,
Are Pendell-hill, and Pennigant.

Another.

There's Pendell-hill and Pennigant,
And also Ingleborrow,
You cannot find three more such hills,
And search all England thorough.

On the East of Lancashire.

There's Axedge and Combe's-Moss,
And also Kenderscout,
There's not three more such hills,
For many miles about.

In the North of Derbyshire.

Reasons explain'd for the Springs of
HOT WATER coming out of the
Bowels of the COLD EARTH.

THE springs of hot water coming out of the bowels of the cold earth has been looked upon in all ages, as an unaccountable phænomenon : and in reality, appears as strange to common capacities, as any thing produced by nature : notwithstanding which, I think there may be given such substantial reasons how the said waters are so heated, as will admit of no doubt or contradiction.

There are four hot springs in this kingdom, viz. at Bath and Bristol, in the county of Somerset, and at Buxton and Matlock, in the county of Derby; and I chiefly take my observations from the two latter, as being better acquainted with that country.

Though there are several of those hot springs both at Bath and at Buxton, I include them as one at each place, as being so contiguous to one another, and all come, without doubt, from the very same place in the bowels of the earth, as well as heated by the same cause.

The reasons here laid down will be best understood, by such of my readers as have
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some knowledge of the countries in which those places are situated, or whose curiosities have ever led them to take some notice of the different sorts or qualities of land which border one upon another, at or near the places where those hot springs are produced ; as also the different qualities of water, which in many places proceeds from those two quite different sorts of land.

The two different sorts of land I here speak of, are distinguished by the names of limestone and gritstone lands ; each of which sort, in many places, extend forty or fifty miles round, without any intermixture of the other.

The former of those two sorts of land is in nature much like that composed of flint and chalk ; and the stone may be said to be between the two, as being somewhat softer than the flint, but harder than the chalk, and of a white colour. The latter is so called from its stone being of a gritty or sandy kind, and is that sort which is hewn and used for buildings ; the particles, nay even the very atoms, of each of those two sorts of earth are the very same as the stones. The limestone land produces mines of copper, tin, and lead, but mostly the last ; and its springs of water are very transparent, of a pale colour, and mostly very hard, and of such a petrifying quality, that where it drops from the roofs of some caves which are near
Buxton,

Buxton, it congeals to a hard stone; forming something like icicles from whence it drops above, and makes a pillar of stone in the place on which it falls.

The gritstone land almost generally produces mines of coal and iron: its waters are not so pale as the others, and are mostly of a softer quality; and where there are springs in those lands where the coal lies, near the earth's surface, I have seen the water of a deep red colour; and when out of the earth it turns to a red, coagulated, thick consistency, so as entirely to stop the passage by which it is conveyed from its source; and so very strong of sulphur (which consequently proceeds from the coal and ironstone, which generally lie together) that such mineral or spaw waters are, in many places, by the people of the country called Brimstone-springs: one of which is within a little more than an hundred yards of the hot bath at Buxton. The limestone lands, I believe, never produced mines of coal or iron, or did the gritstone lands ever produce mines of copper, tin, or lead; except for a very little space from where it borders upon the other.

Now it may be very justly supposed, that that mineral or spaw water so full of sulphur, proceeding from the iron and coal, which lie in the gritstone lands, communicates in a large quantity, either in some ca-

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vern,

vern, or in the open pores of the earth, with the waters which proceed from the limestone lands, and being of reverse qualities, creates so strong a fermentation, when incorporated together, as to raise it to so great a degree of heat.

There can nothing be more evident, than that the heat proceeds from a fermentation, as nothing else but fire can ever give heat to a body of cold liquid: and it is impossible there can be fire in the bowels of the earth, without forming a volcano at the surface.

I have known by near twenty years experience, that a large body of worts, perhaps an hundred and fifty barrels, brewed for distillation, by having undergone a strong and hasty fermentation with yeast, otherwise barm, and having continued in that large body all together, in one vessel, till the fermentation was quite spent (which is different from the method of brewing for beer, &c.) that it has thereby been raised to such a degree of heat, as would scarce admit of a person putting in their naked hand: which heat proceeded from a fermentation occasioned by the reverse qualities of two cold bodies: and 'tis most evident, that the hot waters coming out of the bowels of the cold earth, can proceed from no other but the very same cause.

Reasons, shewing why that great
CURRENT, or STREAM always sets
in at the MOUTH of the MEDITER-
RANEAN, called the STRAITS of
GIBRALTAR ; and that SEA, which
has no other communication with
the MAIN OCEAN, but at that nar-
row Passage, is still never the
fuller.

AMONG the unaccountables, which
have in all ages puzzled the world,
is that great current, or stream, which
always sets in at the mouth of the Mediter-
ranean sea, called the Straits of Gibraltar ;
and that sea, which has no other communi-
cation with the main ocean, but at that nar-
row passage, is still never the fuller.

I have heard (and by able and learned
men) divers arguments relative to the reason
thereof, all which, I think, fell far short of
the true purpose : some believing, there
might be a subterraneous passage through
the earth into some other sea, &c. whilst
others support an opinion, that the current
sets out with the same force at the bottom,

as it sets in at the top ; but it is very certain, there must be some other cause more substantial, for as the earth and water together make one compleat globe, it is most evident, that (allowing for the tides and waves) the surface of the sea is every where at an equal distance from the earth's center.

I now, with submission, offer my opinion on this subject, and should it agree with any that has been made public before, it is nevertheless my own genuine thought, because I never have seen or heard of any treatise of that kind ; nor did I ever hear of any argument concerning it, terminate in the manner I have here laid down.

I believe, I may presume, it will be readily granted, that the element of water communicates itself through the pores of the earth throughout the whole massy globe, as the blood through all human and animal bodies : this is demonstrated by finding springs everywhere in the bowels of the earth, by digging wells, mines, &c. and that every river in the world, however so immensely large, all originally come from springs : which by their courses become united together, so as to form first smaller, and then greater rivers.

Let any one take a view of the river Thames at Windsor (I mention that place as being above the flux of the tide) and I dare say, he will think that stream (though far

far inferior to many in the world) would in a very little time be sufficient to drain all the water out of the earth in the whole kingdom, so as to leave it as dry as dust without any moisture, were there not a continual supply, infusing itself through the pores of the earth, to support those almost innumerable springs, from which such great rivers are collected.

Now comes the question, viz. From whence doth this prodigious supply come? To which, I think, every rational being must answer, *From the Sea* ; as being regularly circulated from thence, through the pores of the earth, even to the remotest inland parts of the continent.

Here many will urge, that the springs have their supply chiefly from the moisture of the earth occasioned by rains ; by reason they are subject to be dried up in hot, dry seasons ; to which, I think, the following answer will hold good : that the springs are not stopped for want of their usual supply ; but rather that the waters are wasted and dried away by the heat, in such seasons, as they rise towards the earth's surface : though I must allow that a deal of rain increases some springs, and, by the same rule, the want of it may help to impair them : but, I think, it would be very absurd in any one, to suppose such a quantity of rain to fall in a part of three or four neighbouring counties, as to
supply

supply so many springs as produce such a perpetual stream as the river Thames, which flows from thence, and all other rivers by the same rule.

There are a great number of rivers, and many of considerable note, that have their source in those countries bordering on the Mediterranean sea, as in the several nations of Europe and Asia on the east and north, and all Africa on the south.

To this may be answered, that if the rivers now mentioned, have their supply from that sea, as being circulated through the pores of the earth, to those springs which first form them, that the said sea receives them again; and therefore it can make no material difference: but then, let it be considered, what a prodigious extent of land lies on the east, north and south of that sea, and what an immense number of rivers have their source in those countries, that empty themselves into the other great oceans, which join to the other sides of those great tracts of land.

As that long narrow sea runs so far into the middle of that vast great continent, it cannot otherwise be supposed, but that it supplies the bowels of the earth with water to as great a distance from it, as the other great oceans which are many thousands of times larger; and therefore as it is surrounded with such a great extent of land, and so far

far from the other main oceans, it may justly be concluded, that it furnishes both the bowels of the earth, and the exhalations which form the atmosphere to water those immense great continents on both sides of it, with abundantly more than in proportion to the quantity it contains, when compared with other great seas which make a part of this globe. The exhalations in that hot part of the world must be very great, and that extraordinary wastage (occasioned by that as well as by the circulations through the earth, as before mentioned, as water will always run to a level) must in course be supplied from the main ocean, through that narrow passage by which it communicates. From the aforesaid causes, the Caspian sea, and many other considerable lakes in the world, receive many great rivers, and notwithstanding they have no visible discharge are still never the fuller : which is a strong confirmation, that the water is circulated from the sea through the pores of the earth, to supply the springs all over the face of the whole globe, as well as exhaled to form the atmosphere that surrounds it.

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